STATE OF SOUTH CAROLINA

BEFORE THE PUBLIC SERVICE COMMISSION

DOCKET NOS. 2019-224-E AND 2019-225-E

In the Matter of: South Carolina Energy Freedom Act (House Bill 3659) Proceeding Related to S.C. Code Ann. Section 58-37-40 and Integrated Resource Plans for Duke Energy Carolinas, LLC and Duke Energy Progress, LLC	)	SURREBUTTAL TESTIMONY OF JAMES F. WILSON ON BEHALF OF NATURAL RESOURCES DEFENSE COUNCIL, SOUTHERN ALLIANCE FOR CLEAN ENERGY, SIERRA CLUB, SOUTH CAROLINA COASTAL CONSERVATION LEAGUE AND UPSTATE FOREVER

I. INTRODUCTION

Q: Are you the same James F. Wilson who submitted direct testimony in these dockets on February 5, 2021, on behalf of Natural Resources Defense Council, Southern Alliance for Clean Energy, Sierra Club, South Carolina Coastal Conservation League, and Upstate Forever?

A: Yes.

Q: What is the purpose and scope of your surrebuttal testimony?

A: Duke Energy Carolinas, LLC ("DEC") and Duke Energy Progress, LLC ("DEP") (collectively, "Companies") filed rebuttal testimony on March 19, 2021 in these dockets. My surrebuttal testimony responds to the rebuttal testimonies of witnesses Glen A. Snider and Nick Wintermantel regarding the Companies' resource adequacy studies, the recommended reserve margins, and a few other topics.

Q: Does any of the rebuttal testimony lead you to change or in any way modify any of your testimony, or anything in your expert report (Direct Testimony Exhibit B) in this proceeding?

A: No.

II. RESPONSE TO THE REBUTTAL TESTIMONY OF WITNESS GLEN A. SNIDER

Q: Witness Snider claims the Companies' load forecasting satisfies South Carolina regulations, stating at page 50, "The load forecast includes scenarios that assume more optimistic conditions and recession-like conditions compared to the base forecast." First, what are the applicable regulations?

A: The relevant statute states that "An integrated resource plan shall include all of the following: (a) a long-term forecast of the utility's sales and peak demand under various reasonable scenarios…". [emphasis added]

Q: What is the basis for Witness Snider's claim that the 2020 Plans satisfy this requirement?

A: The 2020 Plans claimed to satisfy this requirement through Chapter 3 and Appendices A and C.[1] The basis for the claim is a sensitivity analysis using Moody's Analytics' forecasts of near-term growth and recession scenarios.[2] The Companies report that this resulted in 2035 Winter Peak demands only 238 MW lower (-1.2 percent) or 107 MW higher (+0.5 percent) than the base case load forecast used in the 2020 Plans.[3]

Q: Does this sensitivity analysis satisfy the regulatory requirement?

A: No. These sensitivity analyses utterly fail to characterize the high degree of uncertainty with regard to long-term peak loads. Thus, they fail to consider "reasonable scenarios" of future peak load growth. The purpose of such sensitivity analysis should be to explore whether the recommended supply plans and investments are still warranted under reasonably likely alternative scenarios.

[1] DEC 2020 IRP Table N-2, page 383.

[2] DEC 2020 IRP p. 153.

[3] DEC 2020 IRP p. 154, Table A-2.

The high uncertainty about future peak loads is reflected in the Companies' forecasts. For example, in DEC's 2014 Plan, the forecast 2020 summer peak load was over 20,000 MW.[4] DEC's actual 2020 weather-normalized peak load was more than 10% less than this, below 18,000 MW.[5] Had the 2014 Plan anticipated the sharply lower peak load levels, the Plan would have contained very different resource mix recommendations.

The Companies' load forecast sensitivity analysis, which appears to suggest very little uncertainty about future peak loads, is also highly inconsistent with the economic load forecast error assumptions used in the Companies' resource adequacy studies.[6] The RA Studies assume that due to economic forecast error (not due to weather; that is an additional source of uncertainty), the Companies load forecasts can be two percent or more too high or too low, four years out, with substantial probability.[7]

Q: You testified that the RA Studies and the Companies' Winter Peak Study were "highly inconsistent and contradictory." Does Witness Snider disagree?

A: Apparently not. Witness Snider notes that the RA Studies must consider the likelihood of extreme weather in order to identify the reserve margin to provide

[4] DEC 2014 Plan Table 3-A, Load Forecast with Energy Efficiency Programs.

[5] Response to Data Request ORS 2-37.

[6] Astrapé Consulting, *Duke Energy Carolinas 2020 Resource Adequacy Study*, Prepared for Duke Energy, September 1, 2020, DEC 2020 Plan Attachment III ("DEC RA Study") and Astrapé Consulting, *Duke Energy Progress 2020 Resource Adequacy Study,* Prepared for Duke Energy, September 1, 2020, DEP 2020 Plan Attachment III ("DEP RA Study") (collectively, "RA Studies").

[7] DEC RA Study Economic Load Forecast Uncertainty, page 28 Table 4 (assigning 25% probability to outcomes 2% or more above, and 35% probability to outcomes 2.7% or more below, the four-year forward forecast).

reliable service, but claims that "In contrast, the Winter Peak Study was not focused on an extreme weather event..."[8] However, it is unclear what the point of the Winter Peak Study[9] could have been if the study was not focused on extreme weather events, as extreme weather events drive winter peaks and winter resource adequacy needs.

Witness Snider further excuses the inconsistency between the RA Studies' extreme peak load assumptions and the Winter Peak Study, stating, "The Winter Peak Study was not specifically intended to assess forecast parameters used in the resource adequacy studies…"[10]

Q: You testified that the RA Studies modeled extreme conditions that drive the RA Studies' results, while "The Winter Peak Study does not explicitly consider such extreme conditions or evaluate programs specifically designed to reduce loads under such conditions (such as inducements for facilities to open late or remain closed)." Does Witness Snider disagree?

A: Apparently not. Witness Snider now claims the Winter Peak Study was intended to identify EE/DSM programs that would offer savings "across all winter peak days,"[11] [emphasis added], rather than focusing on the extreme conditions that challenge resource adequacy and really matter.

Q: Witnesses Snider and Wintermantel disagree with your testimony that the RA Studies overstate the likelihood of extreme cold events, citing to an Electric Power Research Institute ("EPRI") Study. First, what did the witnesses and the EPRI study say about extreme cold events?

[8] Snider Rebuttal, p. 57 lines 4-12.

[9] Tierra Resource Consultants, Dunsky Energy Consulting, and Proctor Engineering Group, *Duke Energy Winter Peak Analysis and Solution Set, Duke Energy Winter Peak Demand Reduction Potential Assessment,* and *Duke Energy Winter Peak Targeted DSM Plan*, December 2020 (Winter Peak Study Task 1, Task 2 and Task 3 Report, respectively, and collectively "Winter Peak Study").

[10] Snider Rebuttal p. 57 lines 19-20.

[11] Snider Rebuttal p. 57 lines 20-23.

A: Witness Snider states as follows:[12]

> However, it is important to note that Witness Wilson's view on the likely frequency of future extreme cold events is at odds with a recently released Electric Power Research Institute ("EPRI") study, which found that extreme events are occurring more, not less, frequently.

Witness Wintermantel's testimony is the same in relevant part:[13]

"Further, EPRI recently released a report concluding that extreme weather events are occurring more, not less, frequently."

The portion of the EPRI Study cited by both witnesses states that "Cold events are less cold on average but are increasing in frequency."[14]

Q: What is the basis for this statement in the EPRI Study?

A: The EPRI Study cites (footnote 37) to the U.S. government's Fourth National Climate Assessment as the sole basis for the statements,[15] which states as follows (Volume 1, page 185): "The frequency of cold waves has decreased since the early 1900s… The temperatures of extremely cold days and extremely warm days are both expected to increase."

The Fourth National Climate Assessment further found that the temperatures of even 1-in-10-year extreme cold events were increasing over time (p. 189):

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[12] Snider Rebuttal p. 58 lines 13-16, citing to Electric Power Research Institute, *Exploring the Impacts of Extreme Events, Natural Gas Fuel and Other Contingencies on Resource Adequacy,* at 4-2 (Jan 28, 2021).

[13] Wintermantel Rebuttal p. 14 lines 2-3.

[14] EPRI Study p. 4-2.

[15] U.S. Global Change Research Program, *Climate Science Special Report: Fourth National Climate Assessment,* available at: https://science2017.globalchange.gov/.

> Cold extremes have become less severe over the past century. For example, the coldest daily temperature of the year has increased at most locations in the contiguous United States. The temperature of extremely cold days (1-in-10 year events) generally exhibited the same pattern of increases as the coldest daily temperature of the year.

The Fourth National Climate Assessment also included a chapter on arctic changes and their potential impact on the rest of the United States, but made no findings in this regard, only concluding that "The nature and magnitude of arctic amplification's influence on U.S. weather over the coming decades remains an open question." [16]

Q: Please summarize the relevance of the EPRI Study and Fourth National Climate Assessment to the issues in these dockets.

A: Contrary to the claims of witnesses Snider and Wintermantel, the EPRI Study, and the Fourth National Climate Assessment it relies upon, support the view that the temperatures on the most extremely cold days have been increasing over time, and that this is expected to continue. This means that the RA Studies, whose results are driven by very extreme cold from the 1980s, overstate the likelihood of such extreme cold in future years, and this contributes to overstating winter resource adequacy risk.

III. RESPONSE TO THE REBUTTAL TESTIMONY OF WITNESS NICK WINTERMANTEL

Q: Witness Wintermantel states that the Companies' reserve margin "falls on the low end of the range of planning reserve margins in the region", citing a survey by Kennedy and Associates on behalf of ORS. Are such comparisons meaningful?

[16] Fourth National Climate Assessment, p. 313.

A: No, comparisons of reserve margins across regions and utilities are generally not meaningful, because there are so many differences in regional circumstances and also in the many details about how reserve margins are calculated. I note that PJM Interconnection, L.L.C. ("PJM") used to include such a comparison in its annual Reserve Requirements Report, but has eliminated it in its most recent report, because the comparison was inaccurate, difficult to update, and subject to misunderstanding or misinterpretation.[17]

It is very difficult to prepare an "apples to apples," meaningful comparison of reserve margins across regions. First, every region is different and will require a different planning reserve margin to provide the same reliability. Regions differ in size, load shapes and diversity, resource mix and size of largest forced outages, and the likelihood and quantity of assistance available from adjacent regions, to name a few differences that impact resource adequacy analysis. Second, every region applies a somewhat different approach to calculating planning reserve margins. Differences include how load diversity, external assistance, and demand response are reflected, to name a few issues.

Q: Witness Wintermantel claims (at p. 9) that the regression Astrapé used for DEC had an R^2 of 0.95, "indicating that 95% of the DEC load variability could be explained by temperature," again citing to the Kennedy and Associates report. Does this support the use of this regression rather than your alternative regression?

A: No. The regression I performed also has an R^2 of 0.95. The difference was that my regression focused on colder temperatures. Accordingly, the result of my

[17] See for instance, PJM, *2019 Reserve Requirement Study,* Appendix D, ISO Reserve Requirement Comparison; which appendix was removed in the 2020 study; both studies are available at https://www.pjm.com/planning/resource-adequacy-planning/reserve-requirement-dev-process.

regression is a more accurate estimate of the impact of extreme cold on load at very low temperatures.

Q: Witness Wintermantel repeatedly notes the extreme cold and outages in the Electric Reliability Council of Texas ("ERCOT") region last February. Did those events change your views or recommendations on any of the issues you addressed in your testimony and report (Exhibit B to your direct testimony)?

A: No. The outages occurred because in Texas, extreme cold is rare, and power plants are generally not winterized. In ERCOT's "energy only" market, power plant owners do not have a regulatory requirement or market incentives to invest in winterization, which would only very rarely be valuable. By contrast, the Companies' power plants are winterized, as evidenced by the moderate impacts of extreme cold on outage rates.

Witness Wintermantel primarily cites to the ERCOT events ("ERCOT" and "Texas" appear 35 times in his rebuttal testimony) in support of the use of historical weather data that includes extreme temperatures that have not been seen in decades. As noted above, the Fourth National Climate Assessment concluded that the temperatures on the most extremely cold days have been increasing over time, based on analysis of many decades of historical data for the entire country. One instance of extreme weather in one other region does not change this assessment.

Q: Would a higher reserve margin have mitigated the impact of the extreme cold in Texas?

A: No. The region had an adequate reserve margin. The outages (and downstream impacts of the outages, for instance on water delivery systems) occurred

primarily due to the lack of winterization of the region's power plants and resulting very large amount of inoperable capacity.

Q: Witness Wintermantel also notes, as did Witness Snider, the recent EPRI report. What is your response?

A: I discussed the findings of the Fourth National Climate Assessment, upon which the EPRI report relied, in my response to Witness Snider, above.

Q: Witness Wintermantel asserts that your recommendation regarding the Companies' reserve margins is unclear. Is this correct?

A: No. My testimony and report both clearly state that the reserve margin in place until the 2016 IRP, which is only slightly lower than the current recommendation, would still be adequate.[18] Of course, correcting the flaws I have identified in the RA Studies would lead to a somewhat lower recommended reserve margin, but this can't be quantified without the further analysis.

The RA Studies identify a 16.75% reserve margin for the "combined" case, ultimately recommending 17% for each utility. While not stated, this is a winter reserve margin. Both RA Studies state that the 17% winter reserve margin results in summer reserves above 15% (RA Studies page 18 and footnote 16). Accordingly, the 14.5% summer reserve margin in place before 2016 would correspond to a 16.5% winter reserve margin.

[18] Direct Testimony p. 6, Exhibit B pages 8, 38.

Q: Witness Wintermantel asserts (p. 16) that you do not understand the relationship between summer and winter reserve margins. Is this correct?

A: No. Witness Wintermantel attempts to leverage the rambling, imprecise and in places contradictory discussion of reserve margins in the RA Studies (pp. 3-18, pp. 44-53), which ranges across different cases (Island, Physical, Economic, Combined), and in places does not state which case or season is discussed. While the recommended reserve margins in both RA Studies are based on the "Combined" case, he cites to individual company results to suggest that my recommendation is confused. I simply relied upon the clear recommendation in both RA Studies at p. 18 (17% winter, which provides 15% summer), and suggested that 16.5%/14.5% would be adequate.

Q: Witness Wintermantel (at p. 16) claims that you stated in response to a discovery request, "Mr. Wilson's testimony did not purport to recommend a specific reserve margin" and suggests that this further adds to the "confusion." Is this correct?

A: No. Witness Wintermantel improperly quoted only a portion of the language, completely changing the meaning. The discovery request referred to a portion of my testimony that did not contain a reserve margin recommendation, and the response stated, "CCL, et al. object to this request because the quoted portion of Mr. Wilson's testimony did not purport to recommend a specific reserve margin."[19] [emphasis added]

[19] CCL et al.'s Response to DEC and DEP's Request for Production # 1-9, included in part in Wintermantel Rebuttal Exhibit 1.

Q: You testified that the RA Studies represent winter peak loads far in excess of the Winter Peak Study's Study Peak Day (Direct Testimony p. 5; Exhibit B pp. 5, 11, 12). Witness Wintermantel asserts that your comparison is invalid and "apples to oranges" because the RA Studies model 2024, while the Study Peak Day occurred in 2018. What is your response?

A: This is incorrect; my comparisons are valid. I compared the highest loads represented in the RA Studies not to the actual load on the Study Peak Day, but to the load the RA Studies assigned *to the Study Peak Day* (January 5, 2018). For example, my report notes that the majority of the hours with loss of load in the DEC RA Study occurred under scenarios where the DEC load was far above (106% or more above) the load assigned by the DEC RA Study to the Winter Peak Study's Study Peak Day based on the weather that occurred that day. Thus, my comparisons were totally valid and "apples to apples."

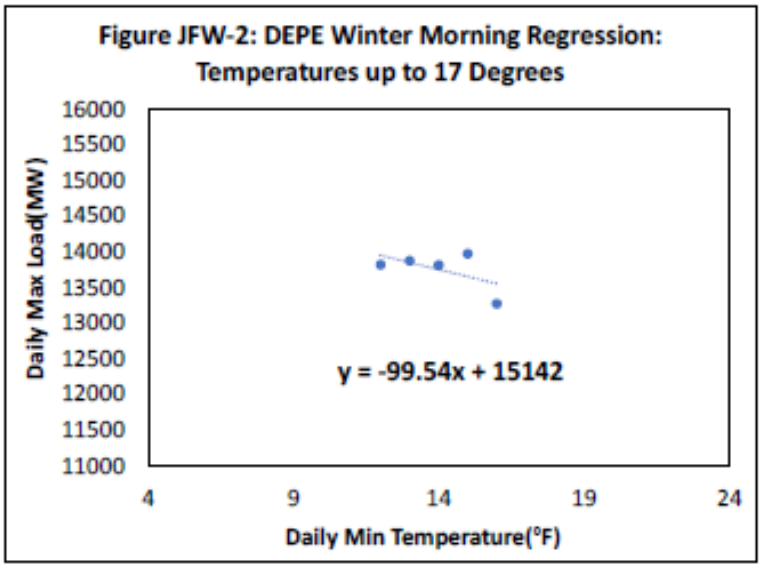
It is also worth noting that had I performed the "apples to oranges" comparison as incorrectly suggested by Witness Wintermantel, the comparison would have *understated*, not overstated, how extreme the RA Study loads are compared to the Study Peak Day. The Companies' forecasts of winter peak loads in 2024 are actually *lower* than the actual and weather-normalized winter peaks from 2018.[20] To perform an "apples to apples" comparison to the Study Peak Day actual or weather-normalized values, the RA Study values would need to be adjusted upward.

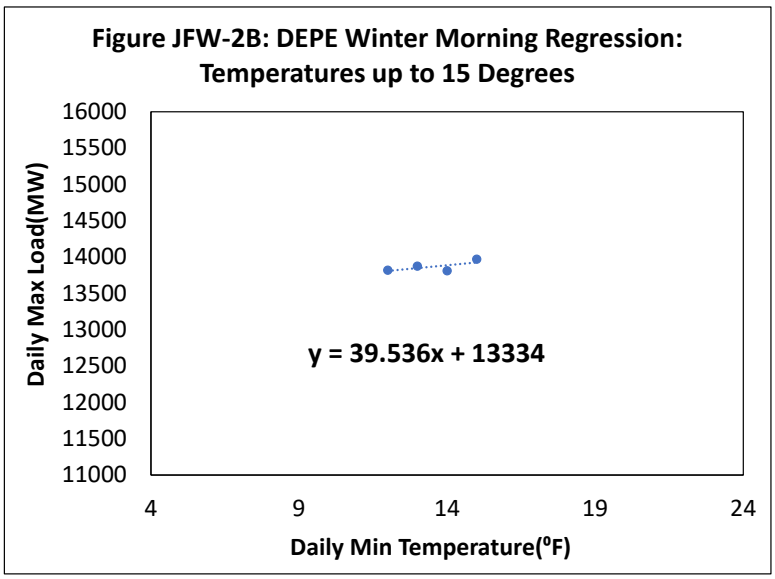
Q: Witness Wintermantel suggests (p. 20) that you selected the data points for your alternative regressions of temperature to load to produce the "lowest response possible." Is this correct?

[20] 2020 Plans Table C-11 (winter peak load forecasts, before reflecting UEE), and response to data request SELC 2-18a (2018 actual and weather-normalized peak loads).

A: This is incorrect. My report explains why the regressions, which will be used to extrapolate to extremely low temperatures, should be focused on the lowest temperature observations, rather than including temperatures up to 20 degrees, as was done for the RA Studies. For both DEC and DEP, my alternative regressions exclude the warmest observations that were included in the regression used in the RA Studies.

Witness Wintermantel asserts that "Based on Astrapé's review, it appears that Witness Wilson selected a set of points that produces the lowest load response possible (99 MW per degree)" referring to my regression for DEP East, which was shown in Figure JFW-2 in my report, reproduced below. However, as can be guessed from Figure JFW-2, if the regression is instead limited to observations under 16 degrees (using only the lowest four observations shown in Figure JFW-2), the estimated impact of incremental cold will be much lower, and in fact it changes sign. This is shown in Figure JFW-2B below. Rather than the 99 MW per degree shown in Figure JFW-2, the coldest four observations suggest that further cold does





not increase loads at all, if anything loads decline with the incremental cold (which could reflect decisions by offices, schools, and other establishments to open late under such extreme conditions).

Thus, the assertion that I selected a set of points that produces the "lowest load response possible (99 MW per degree)" is plainly false.

Q: Witness Wintermantel asserts (p. 21) that by removing an outlier, you removed "one of the more valuable data points the Companies can rely on to estimate cold weather loads." Is it correct that an outlier can be a valuable data point?

A: An outlier can be a valuable data point, if analysts can determine why it is an outlier, and enhance their models accordingly. But Astrapé has no theory of why the point in question is an outlier. In that circumstance, it is generally best to exclude the outlier so it doesn't distort the trend reflected in the remaining data points.

Q: Please elaborate on why it may be best to exclude outliers when they cannot be explained.

A: An example should clarify why outliers are excluded when they cannot be explained. Suppose further research identifies that the data point in question was an outlier (in this instance, load was higher than would be expected based solely on temperature) due to a natural gas distribution system disruption, which led many customers to rely more heavily on any available electrical appliances for space heating. In this example the outlier would have been a valuable data point, because the incident alerts power system managers to expect higher loads whenever natural gas distribution system disruptions occur. The models estimating the impact of temperature on electric loads could be enhanced to reflect the likelihood of such natural gas distribution system disruptions and their impact on electric loads when they occur.

However, note that if such natural gas disruptions are considered very rare, this approach to the modeling would have approximately the same result as

simply excluding the outlier from the data set, since very low probability would be assigned to the event.

Q: Witness Wintermantel asserts (p. 28) that you attempt to "disqualify" the power plant cold-related outage data from January 3, 2018, and calls your response to a data request in this regard "perplexing and nonsensical." How do you respond?

A: First, Witness Wintermantel's assertion does not address the point of the testimony. My report noted (Exhibit B p. 26) that the RA Studies' assumption about cold weather outages was based on a single day (it was actually January 2, 2018), contrary to the RA Studies' claim that the value was a historical average. My report then observed that the single day, January 2, 2018, was a Tuesday following a three-day New Year's weekend, and the outages occurred in the early morning. My report further suggested that had the extreme weather occurred on a more normal winter morning, plant staff may have been in a better position to address the circumstances that arose without having to take a forced outage. The main point was that the RA Studies' adopted assumption for cold-related outages, based on a single, and rather unusual circumstance, was very weakly supported.

Witness Wintermantel does not state what he considers "perplexing and nonsensical" about the testimony and response to data request (which Witness Wintermantel quoted only in part), or rebut any of the specific points. The full text, included below, suggested various ways the unusual circumstances of the specific date may have contributed to a situation where the plant operators were

unable to address cold-related problems that arose, and had to take a forced outage:[21]

> There are many ways the unusual circumstances of this date (the morning following the 3-day New Year's weekend) could have impacted the plant staff's ability to address the circumstances that led to the outage. Many people are traveling on the last day of a holiday weekend, and could be delayed and not get their normal sleep. Perhaps the staffing was different over the holiday weekend than over most weekends, or the usual plant staff were not available on the morning of January 2. Less experienced staff might not be as capable of dealing with the relatively rare problems that can arise under extreme cold.

Q: Finally, Witness Wintermantel testifies that "based on my experience" you only provide critiques that reduce, never increase, reserve margins. How do you respond?

A: First, note that Witness Wintermantel's assertion rests on his lack of familiarity with my work ("based on my experience…"). In fact, while I continue to believe that reserve margins are generally too high in most regions (and evidence over many years in many regions supports my view), I have regularly provided comments that would result in increases in reserve margins and capacity requirements.

For example, at the PJM Load Analysis Subcommittee meeting on November 30, 2020, I commented that PJM's data center forecast for the Dominion Zone for 2021 to 2023 was almost certainly too low (if corrected, this

[21] CCL et al.'s Response to Interrogatory 1-31.

would result in greater capacity needs, contrary to Witness Wintermantel's assertion). As another example, the need to recognize common mode outages has been raised at recent PJM Resource Adequacy Analysis Subcommittee meetings, and I have supported such changes (which would raise reserve margins).

Q: Does this complete your surrebuttal testimony?

A: Yes, it does.